Richard Rideout

The urban forest consists of the trees, other vegetation, buildings and people that make up an urban landscape. Kilbourn Ave., Milwaukee.

Urban Forests

The urban forest is all of the trees and other vegetation in and around a city, village, or development. Traditionally, it has meant tree-lined streets, but an urban forest also includes trees in home landscapes, school yards, parks, riverbanks, cemeteries, vacant lots, utility rights-of-way, adjacent woodlots and anywhere else trees grow in and around a community. It is important to remember that this forest is a complex network of green space, extending beyond property lines and involving many, many different landowners.

The trees in an urban forest may be native remnants preserved during development, but more often, they are deliberately planted. Species range from naturally occurring Wisconsin natives, to cultivated varieties, *cultivars*, of native species, to exotic species from other parts of the country and world. For example, the most common tree in the city of Milwaukee is green ash, a Wisconsin native, though many are cultivars such as 'Marshall's Seedless', 'Summit', or 'Patmore'. The most common street tree in Milwaukee, however, is Norway maple, a European native.

Like other forests, the urban forest is not merely composed of trees. Other vegetation, wildlife, and humans are also a part of the urban forest complex. Gardens, shrubs, natural forbs, and lawns all contribute to the larger forest. Songbirds, small mammals, herptiles, insects, fungi, and other microorganisms also play a role.

However, in an urban forest the most influential organisms are humans. Humans plant trees. We build roads, office complexes, strip malls, houses, and parking lots. We prune shrubs and mow lawns. We compact soil and release pollutants into the air and water, apply pesticides to our yard and trees. We salt the roads, sidewalks, and driveways during the icy winter months. All of these activities have a profound effect on the urban forest.

Benefits of Urban Forests

Urban forests serve many of the same functions as other forests. They affect natural systems, like the water cycle and nutrient cycle. Urban forests are markedly important when considering phenomena like storm water run-off and the urban heat-island effect. A large tree canopy softens the blow from a downpour, allowing rain to soak gradually into the ground reducing flooding, pollution, and sedimentation in rivers and lakes, and recharging local aquifers. Trees and green space affect energy usage by converting sunlight into stored energy instead of heat, providing direct cooling through transpiration and evaporation, and by shading and insulating buildings. This reduces the need both for heating and air conditioning which in turn reduces pollution from burning fossil fuels.

In addition to ecological value, urban forests provide resources for people who live among them. Trees contribute to a sense of community. They muffle noise and provide places to rest, meet, and socialize. Trees increase property values by 5 to 20% [Dwyer, 1995]. People linger and shop longer along tree-

Robert Queen

Urban trees muffle noise, increase property values, and enhance urban dwellers' quality of life.

lined streets. Apartments and offices in wooded areas rent more quickly, and have higher and longer occupancy rates. Businesses leasing office space in wooded areas find their workers are more productive and absenteeism is reduced [USDA, 1990]. Tourism is likely impacted by the "greenness" of a community. Studies have even shown that a "relaxation response" evoked by treed landscapes have a positive correlation to physical health and may even reduce incidences of violent behavior [Ulrich 1991; Sullivan and Kuo, 1996].

Urban Forest Assessment

Defining precisely the boundaries of the urban forest is difficult however, because the change between urban and rural land is gradual. In addition, there are urban developments in otherwise rural townships, along rivers, and particularly around lakes.

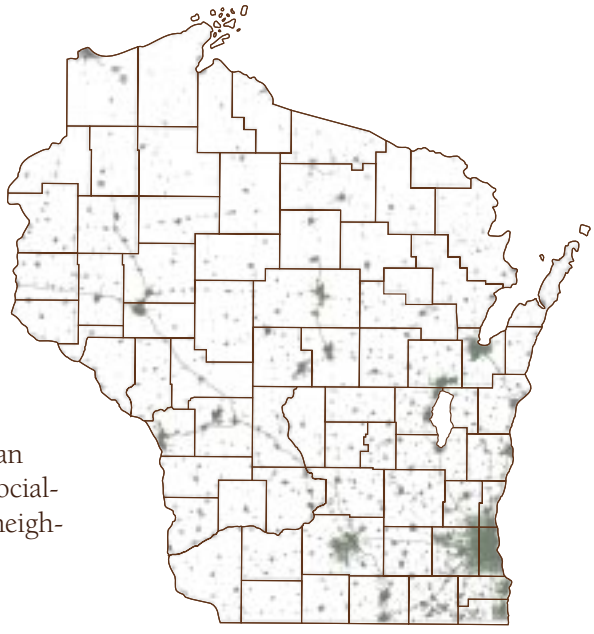
In an effort to define the extent of the urban forest and assess its composition, the DNR, in conjunction with the University of Wisconsin-Stevens Point (UWSP), did an analysis of Wisconsin's communities and developed areas.

According to the DNR/UWSP analysis, Wisconsin has about 875,000 acres of developed land. Cities and villages have an additional 840,000 acres of undeveloped land within their boundaries, giving a total urban forest area of about 1.7 million acres or 4.7% of the total land area in Wisconsin.

Urban forests are more difficult to assess than other types of forests. Many of the functions and resources of the urban forest are intangible and therefore difficult to quantify. What is the value of urban wildlife habitat, for example, or of having a green space in which to socialize? Additionally, people are not used to considering their backyard, neighborhood boulevards and parks, a forest system.

Figure 23

Map of Wisconsin's urban forests (cities, villages, and developed land)



Richard Rideout

The average percent canopy cover in Wisconsin's urban forests is 29%.

Until recently, urban forest assessment was limited to public tree inventories which typically measure tree number, species, size, location and condition of trees in community rights-of-way and green space. Many Wisconsin communities have performed such inventories and used the information to develop and implement urban forest strategic and management plans. As a result, management has steadily improved since 1991 when the DNR began assisting communities in building sustainable tree care programs. During that time, the number of Wisconsin communities providing management for their community trees has more than doubled from 106 to 266.

Richard Rideout

In 1996, Milwaukee's urban forest saved the community over 17 million dollars in flood control, reduced energy, and carbon sequestration. Hyatt Regency, Milwaukee.

Sometimes a monetary value of the trees can be calculated. However, this value is based on casualty loss of the individual trees and does not consider the collective value of the forest. Public tree inventories are an important start, but with public land making up only 10 to 15% of a community's land area and with developed land outside community boundaries being ignored completely, the usefulness of such inventories is severely limited.

The fundamental characteristic now used to assess the entire urban forest is canopy cover. This is a measure of the combined expanse of tree crowns within a community. Increased canopy cover results in greater cooling, greater storm-water mitigation, greater air cleansing, and higher property values. It is also useful as a broad planning tool, showing landscape scale features, and allowing a community to set long-term management goals.

Within a community, canopy cover varies from nearly zero in high-density business or industrial land-use types to more than 75% in low density residential development in mature woodlands. The average canopy cover also varies among regions of the state. In southern Wisconsin, there is less canopy cover since most of the urban development has been in formerly agricultural lands, previously cleared of trees. In northern Wisconsin however, development has expanded into forested land resulting in more urban tree canopy.

In Wisconsin, the average percent canopy cover for developed areas statewide is 29%. Wisconsin's northern region averages 38% canopy cover for its developed areas, while the south central region averages 26% [Miller & Olig, 1999]. The amount of canopy also varies within a community and that variation differs among the state's regions as well. In most communities, the majority of the land area has 25% or less tree canopy cover and very little area with greater than 75% cover. However, as you move generally from southeast to northwest in the state, the percent of the community with little canopy decreases and the percent of the community with heavy canopy increases.

Richard Rideout

As Wisconsin becomes more urbanized, urban forests and green space will become ever more important.

Table 3: Distribution of canopy cover within Wisconsin communities

Region	<26%	26-50%	51-75%	>75%	Average
Northeast	63%	23%	10%	4%	26%
South Central	62%	27%	8%	3%	26%
Southeast	60%	27%	8%	5%	27%
West Central	51%	26%	14%	9%	33%
Northern	42%	29%	18%	11%	38%
Statewide	58%	26%	11%	6%	29%

In addition to assessing canopy cover, new modeling techniques are allowing resource managers and community leaders to estimate some of the economic benefits of the urban forest community. Current models measure the benefits realized in reduced flood control devices, energy savings by reduced need for both air conditioning and heating, and pollution control. In 1996, an ecological analysis of the city of Milwaukee showed that its urban forest reduced the need for flood control devices, saving the city an estimated $15.4 million. Reduced energy needs annually saves $650,000 and carbon sequestration (air pollution mitigation) saves $1.5 million per year [American Forests, 1996].

The DNR/UWSP study was the first statewide study of its kind on such a detailed level, but it's only a beginning. Future assessment models for the urban forest will focus on additional landscape scale ecological characteristics and on urban forest sustainability. Research is currently under way to establish state and local goals for canopy cover, species diversity, age structure, location distribution, and overall health of Wisconsin's urban forests. The intent of this work is to provide urban natural resource managers with tools to assess their community and to develop a strategic plan to achieve sustainability.